## CLAIMS

1.      A programmable input voltage range analog-to-digital converter comprising:

an analog-to-digital converter (ADC) having a characteristic dynamic range; and

an input voltage scaling network in which the input voltage is sampled onto one or more selected sampling capacitors to scale the input voltage to substantially match the characteristic dynamic range of the ADC.

2.      The programmable input voltage range analog-to-digital converter of claim 1, wherein the input voltage scaling network comprises an array of parallel-connected sampling capacitors in an input amplifier providing a sampled input voltage to the ADC.

3.      The programmable input voltage range analog-to-digital converter of claim 2, wherein the sampling capacitors are interposed between the analog input voltage and an input amplifier from which the sampled output signal is derived.

4.      The programmable input voltage range analog-to-digital converter of claim 3, wherein the ADC is a sigma-delta converter.

5.      The programmable input voltage range analog-to-digital converter of claim 3, wherein the ADC is a pipeline converter.

6.      The programmable input voltage range analog-to-digital converter of claim 3, wherein the ADC is a successive approximation converter.

7.      The programmable input voltage range analog-to-digital converter of claim 1, further comprising a network of high voltage sampling switches interposed between the input voltage and the input voltage scaling network.

8.      The programmable input voltage range analog-to-digital converter of claim 7, further comprising range decoder logic that selects one or more elements of the input voltage scaling network on which the input voltage is sampled.

9. The programmable input voltage range analog-to-digital converter of claim 8, wherein the input voltage range is bipolar.

5 10. The programmable input voltage range analog-to-digital converter of claim 9, wherein a network of low-voltage to high-voltage level shifters couples control signals to the high voltage sampling switches.

11. The programmable input voltage range analog-to-digital converter of claim 8, wherein 10 the range decoder logic is responsive to a range selection control word written into an associated range register.

12. The programmable input voltage range analog-to-digital converter of claim 11, wherein the range register is programmable via a digital communication interface.
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13. The programmable input voltage range analog-to-digital converter of claim 12, wherein the digital communication interface is a serial communication interface.

14. The programmable input voltage range analog-to-digital converter of claim 13, 20 wherein the serial communication interface is bi-directional.

15. A programmable input voltage range analog-to-digital converter comprising:
an analog-to-digital converter (ADC) having a characteristic dynamic range; and
an input voltage scaling network including an array of parallel-connected sampling
25 capacitors in an input amplifier providing a sampled input voltage to the ADC;
such that the input voltage is sampled onto one or more selected sampling capacitors
to scale the input voltage to substantially match the characteristic dynamic range of the ADC.

16. The programmable input voltage range analog-to-digital converter of claim 15,
30 wherein the sampling capacitors are interposed between the analog input voltage and the input amplifier from which the sampled output signal is derived.

17.     The programmable input voltage range analog-to-digital converter of claim 16, wherein the ADC is a sigma-delta converter.

18.     The programmable input voltage range analog-to-digital converter of claim 16, wherein the ADC is a pipeline converter.

19.     The programmable input voltage range analog-to-digital converter of claim 16, wherein the ADC is a successive approximation converter.

20.     The programmable input voltage range analog-to-digital converter of claim 15, further comprising a network of high voltage sampling switches interposed between the input voltage and the input voltage scaling network.

21.     The programmable input voltage range analog-to-digital converter of claim 20, further comprising range decoder logic that selects one or more elements of the input voltage scaling network on which the input voltage is sampled.

22.     The programmable input voltage range analog-to-digital converter of claim 21, wherein the input voltage range is bipolar.

23.     The programmable input voltage range analog-to-digital converter of claim 22, wherein a network of low-voltage to high-voltage level shifters couples control signals to the high voltage sampling switches.

24.     The programmable input voltage range analog-to-digital converter of claim 21, wherein the range decoder logic is responsive to a range selection control word written into an associated range register.

25.     The programmable input voltage range analog-to-digital converter of claim 24, wherein the range register is programmable via a digital communication interface.

26.     The programmable input voltage range analog-to-digital converter of claim 25, wherein the digital communication interface is a serial communication interface.

27.     The programmable input voltage range analog-to-digital converter of claim 26, wherein the serial communication interface is bi-directional.

28.     A programmable input voltage range analog-to-digital converter comprising:

an analog-to-digital converter (ADC) having a characteristic dynamic range;

an input voltage scaling network including an array of parallel-connected sampling capacitors in an input amplifier providing a sampled input voltage to the ADC, such that the input voltage is sampled onto one or more selected sampling capacitors to scale the input voltage to substantially match the characteristic dynamic range of the ADC;

a network of high voltage sampling switches interposed between the input voltage and the input voltage scaling network, such that the input voltage is selectively sampled onto one or more of the sampling capacitors;

range decoder logic that controls the network of high voltage sampling switches to select said one or more of the sampling capacitors; and

a range register to which a range selection control word is written, the range decoder logic being responsive to the range selection control word.

29.     The programmable input voltage range analog-to-digital converter of claim 28, wherein the ADC is a sigma-delta converter.

30.     The programmable input voltage range analog-to-digital converter of claim 28, wherein the ADC is a pipeline converter.

31.     The programmable input voltage range analog-to-digital converter of claim 28, wherein the ADC is a successive approximation converter.

32.     The SAR ADC of claim 28, wherein the range register is programmable via an integral digital communication interface.

33.     The programmable input voltage range analog-to-digital converter of claim 32, wherein the digital communication interface is a serial communication interface.

34.     The programmable input voltage range analog-to-digital converter of claim 28, wherein the input voltage range is bipolar.

35.     A programmable input voltage range analog-to-digital converter integrated circuit device fabricated on a single substrate, the device comprising:

an analog-to-digital converter (ADC) subsystem fabricated utilizing a standard sub-micron low-voltage CMOS process, and having a characteristic dynamic range;

an input voltage scaling network in which the input voltage is sampled onto one or more selected sampling capacitors to scale the input voltage to substantially match the characteristic dynamic range of the ADC; and

a network of high-voltage MOS sampling switches fabricated utilizing a split gate oxide process to accommodate higher gate voltages, said network of high-voltage sampling switches interposed between the input voltage and the input voltage scaling network, such that the input voltage is selectively sampled onto one or more of the sampling capacitors.

36.     The programmable input voltage range analog-to-digital converter integrated circuit device of claim 35, wherein the input voltage scaling network comprises an array of parallel-connected sampling capacitors in an input amplifier providing a sampled input voltage to the ADC.

37.     The programmable input voltage range analog-to-digital converter integrated circuit device of claim 36, wherein the sampling capacitors are interposed between the analog input voltage and the input amplifier from which the sampled output signal is derived.

38.     The programmable input voltage range analog-to-digital converter integrated circuit device of claim 37, wherein the ADC is a sigma-delta converter.

39.     The programmable input voltage range analog-to-digital converter integrated circuit device of claim 37, wherein the ADC is a pipeline converter.

40.    The programmable input voltage range analog-to-digital converter integrated circuit device of claim 37, wherein the ADC is a successive approximation converter.

5    41.    The programmable input voltage range analog-to-digital converter integrated circuit device of claim 35, further comprising range decoder logic that selects one or more elements of the input voltage scaling network on which the input voltage is sampled.

42.    The programmable input voltage range analog-to-digital converter integrated circuit
10    device of claim 41, wherein the input voltage range is bipolar.

43.    The programmable input voltage range analog-to-digital converter integrated circuit device of claim 42, wherein a network of low-voltage to high-voltage level shifters couples control signals to the high voltage sampling switches.
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44.    The programmable input voltage range analog-to-digital converter integrated circuit device of claim 41, wherein the range decoder logic is responsive to a range selection control word written into an associated range register.

20    45.    The programmable input voltage range analog-to-digital converter integrated circuit device of claim 44, wherein the range register is programmable via a digital communication interface.

46.    The programmable input voltage range analog-to-digital converter integrated circuit
25    device of claim 45, wherein the digital communication interface is a serial communication interface.

47.    The programmable input voltage range analog-to-digital converter integrated circuit device of claim 46, wherein the serial communication interface is bi-directional.
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48.    A programmable input voltage range analog-to-digital converter integrated circuit device fabricated on a single substrate, the device comprising:

an analog-to-digital converter (ADC) subsystem fabricated utilizing a standard sub-micron low-voltage CMOS process, and having a characteristic dynamic range;

an input voltage scaling network in which the input voltage is sampled onto one or more selected sampling capacitors to scale the input voltage to substantially match the

5  characteristic dynamic range of the ADC;

a network of high-voltage MOS sampling switches fabricated utilizing a split gate oxide process to accommodate higher gate voltages, said network of high-voltage sampling switches interposed between the input voltage and the input voltage scaling network, such that the input voltage is selectively sampled onto one or more of the sampling capacitors;

10  range decoder logic that controls the network of high voltage MOS sampling switches to select said one or more of the sampling capacitors; and

a range register to which a range selection control word is written, the range decoder logic being responsive to the range selection control word.

15  49.  The programmable input voltage range analog-to-digital converter integrated circuit device of claim 48, wherein the ADC is a sigma-delta converter.

50.  The programmable input voltage range analog-to-digital converter integrated circuit device of claim 48, wherein the ADC is a pipeline converter.

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51.  The programmable input voltage range analog-to-digital converter integrated circuit device of claim 48, wherein the ADC is a successive approximation converter.

52.  The programmable input voltage range analog-to-digital converter integrated circuit

25  device of claim 48, wherein the range register is programmable via a digital communication interface.

53.  The programmable input voltage range analog-to-digital converter integrated circuit device of claim 52, wherein the digital communication interface is a serial communication

30  interface.

54. The programmable input voltage range analog-to-digital converter integrated circuit device of claim 53, wherein the serial communication interface is bi-directional.

55. The programmable input voltage range analog-to-digital converter integrated circuit device of claim 48, wherein the input voltage range is bipolar.